

I.

INTRODUCTION

A. OVERVIEW

Architectural coatings are coatings applied to stationary structures and their accessories, and include such coatings as house paints, stains, industrial maintenance coatings, and traffic coatings. Emissions from architectural coatings in California are estimated to be about 130 tons per day (TPD), on an annual average, of volatile organic compounds (VOC) in 1995. This represents about eight percent of the total stationary source VOC emissions, and about four percent of all VOC emissions statewide. This 130 TPD is more than all the VOC emissions from petroleum refining and marketing combined, and is comparable in size to the VOC emissions from the emission categories of pesticides, degreasing operations, and all other coatings.

VOC emissions are precursors to the formation of ozone and particulate matter (PM), two of the most serious air pollutants in California, for which the State and national ambient air quality standards are exceeded in much of the state. VOCs react photochemically with oxides of nitrogen (NO_x) to form ozone. Ozone is a strong oxidizer and irritates the human respiratory system and damages plant life and property. VOCs also react in the atmosphere to form PM₁₀ (particulate matter with an aerodynamic diameter less than 10 microns in size). PM₁₀ is inhaled deep into the lungs and reduces human pulmonary function and increases inhalation of toxic compounds. In the atmosphere, PM₁₀ limits visibility.

Control of emissions from architectural coatings is primarily the responsibility of the local Air Pollution Control Districts (APCD) and Air Quality Management Districts (AQMD). The Air Resources Board (ARB or Board), in part through its oversight responsibilities, approved a Suggested Control Measure (SCM) for architectural coatings in 1977, and amended it in 1985 and 1989. The 1989 amendments (Appendix B) were undertaken in cooperation with the California Air Pollution Control Officers Association (CAPCOA). The SCM has been used as a model for districts when adopting and amending their local architectural coatings rules. The traditional approach used to reduce emissions through architectural coatings rules is by setting VOC content limits for various coating categories. In this way, high-VOC coatings are either replaced by existing low-VOC coatings, or the high-VOC coatings are reformulated to meet the VOC limits.

Given the advances in coating technologies over the past ten years, and given the need for further emission reductions to attain health-based air quality standards in many districts, the ARB, in cooperation with the districts, has undertaken several projects in the last few years to evaluate the technology of architectural coatings. The ultimate goal of these projects was to determine if the 1989 SCM could be updated so that further emission reductions can be achieved from architectural coatings when districts adopt or amend architectural coatings rules.

In this staff report, we present the results of nearly two years of study of architectural coatings, which ultimately led to our proposal to update the SCM. Our evaluation included a

survey of architectural coatings sold in California, an evaluation of United States Environmental Protection Agency's (U.S. EPA) National Rule for Architectural Coatings (National Rule), an examination of several compliance flexibility options, and technology assessments. We also present several proposed long-term efforts that can ultimately improve the effectiveness of the SCM and district architectural coatings rules.

B. ARCHITECTURAL COATINGS INDUSTRY

Architectural coatings, as defined in the SCM, are coatings that are applied to permanent structures or portable buildings, to pavements and curbs, and to any accessories to stationary structures. To be classified as an architectural coating, a coating must be applied in the field, at the site of installation, rather than in a shop or factory where pollution control equipment may be installed. Encompassed in the architectural coatings category are coatings applied to homes, schools, factories and processing plants, public utilities, and structures. The accessories included in the definition range from pipes to downspouts.

Coatings are used primarily for beautification and protection. Architectural coatings are designed specifically to be applied to a variety of surfaces, including metal, wood, plastic, concrete, bricks, and plaster. Some coatings are designed to be on the surface, while others are meant to be on the substrate with other coatings adhering to them. Some coatings are designed to impregnate the surface, while others are transparent and allow the substrate to be visible. Some of the specialty coatings in the architectural coatings category are formulated to withstand traffic, electrical energy, chemicals, caustics, and abrasion. Architectural coatings are applied by a variety of methods including brush, roller, spray gun, or specialized equipment. Architectural coatings must also meet the application and performance expectations of do-it-yourselfers, professional painting contractors, and maintenance personnel.

Architectural coatings are formulated using four main categories of ingredients:

- Resins (polymers or binders) that bind the pigments and additives together and form a film upon drying. Sometimes copolymers are used to modify the properties of the primary resin. Some resins used in architectural coatings include alkyds, latex, oils, vinyls, acrylics, cellulosics, epoxies, urethanes, and polyurethanes.
- Pigments, finely ground powders dispersed in the paint, provide its color, ability to hide the underlying surface, and other properties.
- Solvents are the volatile carriers used to control the viscosity of the paint and provide application properties. Some solvents used are water, alcohols, glycols, glycol ethers, ketones, esters, and aromatic or aliphatic hydrocarbons.
- Additives or specialty chemicals, which assist in manufacture and application, may improve the properties of the finished film. Some examples of additives include

preservatives, wetting agents, coalescing agents, freeze-thaw stabilizers, anti-foam agents, and thickeners.

In addition, extenders such as limestone, clay, gypsum, talc, and silica are sometimes added for performance characteristics or to control cost, but extenders generally are detrimental to application, gloss, and overall durability of coatings. Therefore, the highest performing paints consist of a balanced formulation of pigments and binders. They are available in a wide range of colors, gloss, and performance characteristics.

One important criterion for selecting coatings is durability. Exterior paints must be able to stand up to sunlight, humidity, water, heat, cold, ice, snow, and air pollution. Interior paints are chosen for their color, gloss, and ability to withstand scrubbing.

Architectural coatings are usually purchased ready-to-use, although some come in two components that must be mixed prior to application. Coatings are sometimes thinned when they are too thick to spray or brush, or when low temperature or high humidity hamper application properties. Water-based coatings are thinned with water only, whereas solvent-based coatings can only be thinned with organic solvents. Solvents are also used with water-based coatings following soap and water cleanup of spray guns to prevent deterioration of the equipment.

Table I-1 shows the top ten architectural coatings manufacturers, by volume, in California in 1996, listed alphabetically.

Table I-1
Top Ten Architectural Coatings Manufacturers
(in California in 1996)
Behr Process Corporation
Conco Paint Company
Dunn-Edwards Corporation
Frazer Industries
ICI Paints
Kelly-Moore Paint Company
Sherwin-Williams Company
Smiland Paint Company
Vista Paint Corporation
Western Colloid Products

C. BACKGROUND

Before discussing the proposed SCM, it is important to first review a brief history of the regulation of architectural coatings in California, including recent federal activities, as well as the State Implementation Plan commitments, for architectural coatings.

1. History of the Regulation of Architectural Coatings in California

Widespread regulation of emissions from architectural coatings in California began with the approval of the SCM for architectural coatings by the ARB in 1977. Subsequently, many of the local air districts adopted rules based on this SCM. ARB's SCM was amended in 1985, and most recently in 1989. Again, many districts adopted or amended their architectural coatings rules after these revisions to the SCM. Districts have also revised their rules independent of changes to the SCM.

Currently, 17 of California's 35 local air districts have an architectural coatings rule. These 17 districts encompass about 95 percent of California's population and are listed in Table I-2. Appendix C lists the current VOC limits for the coating categories contained in these 17 districts' rules. Appendix C also lists the limits in ARB's 1989 SCM and U.S. EPA's National Rule.

Table I-2	
Districts That Have Architectural Coatings Rules	
Antelope Valley APCD	Monterey Bay Unified APCD
Bay Area AQMD	Placer County APCD
Butte County APCD	Sacramento Metropolitan AQMD
Colusa County APCD	San Diego County APCD
El Dorado County APCD	San Joaquin Valley Unified APCD
Feather River AQMD	Santa Barbara County APCD
Imperial County APCD	South Coast AQMD
Kern County APCD	Ventura County APCD
Mojave Desert AQMD	

In 1990, several districts amended their architectural coatings rules based on the 1989 SCM, lowering many VOC limits, which were to go into effect a few years later. Shortly after the adoption of these limits, however, a group of coatings manufacturers filed a lawsuit against the ARB and these districts claiming, among other things, that the 1990 amendments did not comply with the California Environmental Quality Act (CEQA). The lawsuit alleged that the districts' CEQA analyses did not adequately address potentially significant air quality impacts related to seven alleged impacts arising from the implementation of the lower VOC limits. As a result of these lawsuits, the courts invalidated the rules adopted by the South Coast AQMD, the Bay Area AQMD, and Ventura County APCD, on the grounds that these districts did not prepare adequate environmental analyses under CEQA. Accordingly, these districts were prevented from going forward with the lower VOC limits for industrial maintenance coatings, lacquers, quick-dry enamels, and quick-dry primers, sealers, and undercoaters. However, Santa Barbara County APCD was not sued within the prescribed time period and retained the VOC limits of their amended rule.

Regarding the environmental analysis prepared by the South Coast AQMD, the District prevailed on six of the seven alleged impacts. The court suggested that further study be undertaken to determine whether or not illegal thinning of coatings in the field results in a negative air quality impact before the 1990 amendments could be re-adopted. An appellate court has rejected the manufacturers' appeals of the original ruling on the other six alleged impacts.

In response to the court's decision, the South Coast AQMD conducted unannounced site visits in 1996 to determine the impact of thinning within the district. This field study determined that although some thinning was occurring, it was not in excess of the district limits. The South Coast AQMD continued to augment their 1996 field study through 1999. Again they concluded that the coating applicators do not engage in widespread thinning, and even when thinning occurs, the coatings' VOC content limits are not exceeded. (South Coast AQMD, 1996, South Coast AQMD, 1999)

The South Coast AQMD amended its rule in November 1996 to lower the VOC limits for some coating categories based on the concept of reformulation of existing coatings. The South Coast AQMD also increased the VOC limit for other coating categories and reinstated higher VOC limits pursuant to the court order. These amendments implemented Phase I of the District's plan for reducing VOC emissions from architectural coatings.

There have been several other lawsuits brought by coatings manufacturers against districts and the ARB since 1990, including lawsuits filed against the South Coast AQMD, the ARB, and the U.S. EPA regarding the South Coast AQMD's adoption of its 1996 rule amendments. The lower courts have ruled in favor of the air quality agencies on essentially all issues, although several issues are still before the courts and have not yet been decided.

The Bay Area AQMD made a minor amendment to its architectural coatings rule in November 1998 to address low solids coatings. The South Coast AQMD again amended its rule on May 14, 1999, to implement Phase II of the District's plan for reducing VOC emissions from architectural coatings, and to readopt limits negated in 1990. Several industry groups filed lawsuits challenging the 1999 amendments based on various legal theories. These lawsuits are still pending before the Orange County Superior Court. While a few preliminary matters have been resolved, the court has not yet issued a decision on the major issues involved in the lawsuits.

Except for the South Coast AQMD, most districts have the same VOC limits as the 1989 SCM for most categories. The most notable exceptions are the industrial maintenance, quick-dry enamels, and quick-dry primer, sealer, and undercoater categories, all of which frequently have higher (less restrictive) VOC limits in district rules than in the 1989 SCM.

Santa Barbara County APCD had the most stringent architectural coatings rule in California during the early 1990s. The current VOC limit of 350 grams per liter (g/l) for lacquers is lower than the South Coast AQMD's 550 g/l current VOC limit for this category. Santa Barbara County APCD has a 340 g/l VOC limit for industrial maintenance (IM) including anti-graffiti coatings, and their current VOC limit for the industrial maintenance high-temperature coatings is 420 g/l. These limits are all lower than the South Coast AQMD's current limits. The quick-dry enamel category has a VOC limit of 250 g/l, which is the limit scheduled to go into effect in the South Coast AQMD in 2002.

San Joaquin Valley Unified APCD and Sacramento Metropolitan AQMD both have current VOC limits of 340 g/l for IM coatings. Placer County APCD, San Joaquin Valley Unified APCD, and Sacramento Metropolitan AQMD have a VOC limit of 340 g/l for industrial maintenance anti-graffiti coatings. For industrial maintenance high-temperature coatings, Placer County APCD, San Joaquin Valley Unified APCD, Sacramento Metropolitan AQMD, and Bay Area AQMD all have a VOC limit of 420 g/l.

2. U.S. EPA and the National Architectural Coatings Rule

In the 1990 Clean Air Act Amendments, the U.S. Congress enacted section 183(e), which established a new regulatory program for controlling VOC emissions from consumer and commercial products. Section 183(e) directs the U.S. EPA Administrator to determine the ozone-forming potential of these products, and to prioritize the need for regulation of these products. Architectural coatings were in the first group of products to be regulated.

In 1992, the U.S. EPA initiated a regulatory negotiation (Reg-Neg) process to assist in fulfilling its obligation for a national architectural coatings rule, as required by section 183(e) of the federal Clean Air Act. The Reg-Neg process is an alternative to the traditional approach to rulemaking in which stakeholders from industry, consumers, air pollution control agencies, environmental groups, and labor organizations attempt to reach consensus on key regulatory issues for developing a rule. In 1992, the U.S. EPA conducted a survey of national sales of architectural coatings and emissions. After two years of negotiations and the proposal of a draft rule, consensus could not be reached, and in September 1994, the Reg-Neg process concluded. The U.S. EPA then initiated development of a national architectural coatings rule through conventional rule development.

The U.S. EPA proposed a draft rule in June 1996 that established specific VOC limits for various categories of architectural coatings. The national architectural coatings rule was finalized in September 1998. The National Rule went into effect throughout the country, including all California districts, on September 13, 1999.

The National Rule contains over 20 categories that are not typically included in district rules. In addition, for many of the categories that are in both the district rules and the National Rule, the National Rule has definitions that differ significantly from those of the district rules. All but two of the VOC limits in U.S. EPA's National Rule are equal to or less stringent than existing district rules. Roof coatings and traffic paints are the two categories that have lower VOC limits in the National Rule than most district rules. The applicable VOC limits in the National Rule are also listed in Appendix C and are compared to the proposed SCM. Further discussion of the National Rule is contained in Chapter III.

3. State Implementation Plan Commitments

In November 1994, the Board adopted California's 1994 State Implementation Plan (SIP) for ozone to comply with the federal Clean Air Act. The SIP is California's master plan for achieving the federal air quality standards. It includes the individual local air districts' air quality programs, the ARB's mobile source, fuels, and consumer products control programs, California's vehicle inspection and maintenance programs, and federal measures. California's 1994 Ozone SIP was approved by the U.S. EPA in September 1996.

Five local air districts in four federal ozone nonattainment areas included control measure commitments in the 1994 Ozone SIP to achieve additional VOC emission reductions from architectural coatings. These districts are the South Coast AQMD, Ventura County APCD, Yolo-Solano AQMD, Placer County APCD, and San Joaquin Valley Unified APCD. Yolo-Solano AQMD and Placer County APCD are part of the same federal ozone nonattainment area referred to as the Sacramento Metropolitan nonattainment area. Table I-3 lists the emission reduction commitments for architectural coatings in the 1994 Ozone SIP by district and by attainment year.

Table I-3 1994 Ozone SIP Commitments For VOC Emission Reductions From Architectural Coating Measures				
District	Attainment Year	Committed Emission Reductions in Attainment Year		Status of Rulemaking
		TPD	Percentage	
San Joaquin Valley	1999 *	1.5	7	In progress
Placer County Yolo-Solano	2005	1.6	9	Adopted 1997 In progress
Ventura County	2005	0.9	15	In progress
South Coast	2010	62.3	75	Adopted Phases I & II

* The U.S. EPA is in the process of reclassifying San Joaquin Valley as severe nonattainment with an attainment date of 2005.

As mentioned earlier, the South Coast AQMD adopted the first phase of its architectural coatings rule in November 1996, and the second phase in May 1999. The Placer County APCD also adopted revisions to its architectural coatings rule in August 1997, fulfilling its 1994 Ozone SIP commitment.

Both the South Coast AQMD and Ventura County APCD have adopted revisions to their 1994 Ozone SIP plans. In 1996, the South Coast AQMD adopted a major revision to their 1994 Ozone SIP plan. This plan revision is the 1997 Air Quality Management Plan (AQMP). The South Coast AQMD's architectural coating commitment changed in the 1997 AQMP, dropping

the percent emission reduction commitment from near-term (by the year 2000) rule revisions, from 75 to 50 percent. The remaining 25 percent reduction is to come from long-term (post-2000) commitments. Overall, the South Coast AQMD's commitment remains unchanged. The ARB approved the 1997 AQMP as a SIP revision in January 1997, and transmitted the revision to the U.S. EPA in February 1997. On January 12, 1999, the U.S. EPA proposed to partially approve and partially disapprove this SIP revision. The U.S. EPA proposed to approve procedural requirements, and baseline and projected emission inventories, but proposed to disapprove VOC and NO_x control measures, the attainment demonstration, and quantitative milestones and reasonable further progress provisions. The architectural coatings plan commitment was among the ones that was lessened in the 1997 AQMP, and the U.S. EPA has proposed to disapprove this commitment. Because the U.S. EPA did not finalize this proposed ruling, the 1994 Ozone SIP was until recently still the applicable SIP for the South Coast AQMD.

In December 1999, the South Coast AQMD adopted an amendment to its 1997 AQMP, which revises the local ozone control strategy of the 1997 AQMP. The ARB approved this amendment in January 2000 as a revision to the ozone SIP and forwarded it to the U.S. EPA. The U.S. EPA approved this 1999 AQMP amendment on April 10, 2000, and it became effective May 10, 2000. Thus, the 1999 amendment to the South Coast AQMD's 1997 AQMP now replaces the 1994 plan as the applicable SIP for the South Coast AQMD. This 1999 amendment includes a proposed third phase revision to Rule 1113 to achieve the remaining emission reductions from architectural coatings committed to in the 1994 Ozone SIP.

In October 1997, the Ventura County APCD likewise adopted revisions to its SIP commitments, including minor revisions to its architectural coatings commitment. These revisions included amending the proposed adoption date and revising the emission reduction commitment. The ARB transmitted these revisions to the U.S. EPA in November 1997. The U.S. EPA finalized approval of this SIP revision on April 21, 1998.

The South Coast AQMD and the San Joaquin Valley Unified APCD are planning to update their SIPs in the year 2001. The emission reduction commitments for architectural coatings will be reviewed as part of this activity. These SIP revisions will also incorporate new statewide emission reduction strategies which ARB staff expects to present to our Board in early 2001.

Table I-4 below shows that staff believes that the proposed SCM will achieve sufficient reductions when compared to the percentage emission reductions claimed by the San Joaquin Valley Unified, Ventura County, and Yolo-Solano districts in their 1994 ozone SIPs. In fact, the proposed SCM is expected to achieve about a 20 percent emission reduction, which is greater than any of the SIP commitments of these three districts. The mass emission reductions in some cases are less than those claimed in the 1994 ozone SIP (see Table I-3), primarily because the architectural coatings emissions inventory used in the 1994 ozone SIP is larger than the 1998 survey data used to calculate emission reductions from this proposed SCM. The official ARB emission inventory for architectural coatings is in the process of being updated to reflect these new data. The values in Table I-4 assume that the emissions from architectural coatings are

approximately 100 TPD, on an annual average, statewide, not including emissions from thinning and clean-up (ARB, 1999). The emission reductions from the SCM are estimated to be 10 TPD, in the non-South Coast AQMD portion of the State.

Table I-4
Comparison of Estimated Emission Reductions From the Proposed SCM
and the 1994 Ozone SIP Commitments

District	District's percent of California's population (A)	District's architectural coatings inventory (100 TPD * A) = (B)	1994 SIP commitment reduction (C)	Recalculated 1994 SIP commitment reduction (B*C)	District's percent of SCM reductions (A/55%)(100) (D)	District's reduction from SCM (D* 10.3 TPD)
San Joaquin Valley	9.3%	9.3 TPD	7%	0.7 TPD	16.9%	1.7 TPD
Ventura	2.2%	2.2 TPD	15%	0.3 TPD	4.0%	0.4 TPD
Yolo-Solano	0.8%	0.8 TPD	9%	0.1 TPD	1.5%	0.2 TPD

In 1997, the U.S. EPA promulgated a new national 8-hour ozone standard, and new national standards for particulate matter (PM₁₀ and PM_{2.5}). On May 14, 1999, the U.S. Court of Appeals for the District of Columbia put implementation of the new standards on hold. The Court ruled that the agency had overstepped its constitutional authority in setting the new standards because, among other things, it did not clearly articulate the rationale used in selecting specific levels for the standards. The court remanded all of the standards to the U.S. EPA for further consideration. During remand, the status of the standards is as follows: (1) the Court vacated the new PM₁₀ standard, (2) the Court left the new eight-hour ozone standard in place, but held that the standard “cannot be enforced,” and (3) the Court will decide in the future whether the PM_{2.5} standard should be vacated outright, or remain in place while the case is remanded to the U.S. EPA. The U.S. EPA appealed the court’s decision to the full U.S. Court of Appeals; however, a narrowly divided Court let the decision stand. U.S. EPA asked the Supreme Court to review the decision and is awaiting their response.

The court decision has no immediate impact on California’s air quality programs, because most of California continues to violate the pre-existing national and State one-hour ozone and PM₁₀ standards, and the court decision did not affect the applicability of these standards. In general terms, California’s one-hour ozone standard is similar in its impact to the new federal eight-hour standard. Regardless of the ultimate legal fate of the new federal standards, ARB and the districts will need to pursue new emission reduction measures to attain the existing standards.

4. California Clean Air Act

In addition to the federal planning requirements, the California Clean Air Act (CCAA) imposes a separate set of planning requirements on local air districts. The CCAA was enacted in 1988, and has the fundamental goal that all areas of California are to attain the State ambient air quality standard for ozone by the earliest practicable date. The State one-hour ozone standard is

set by the ARB, and is more stringent than the federal one-hour ozone standard. As specified in the CCAA, the ARB has designated areas of California to be in “attainment” or “nonattainment” for the State ozone standard. Local districts that are nonattainment for the State ozone standard are required by the CCAA to prepare plans, which must be designed to achieve and maintain the standard by the earliest practicable date. In developing their plans each district determines which measures are necessary to include, as well as the specific details of each included measure.

Of the 35 districts in California, 22 are nonattainment for the State one-hour ozone standard and have air quality planning responsibilities. Of the 22 ozone nonattainment districts, all but five already have an architectural coatings rule. These five districts are the Glenn, San Luis Obispo, Shasta, and Tehama County Districts, and the Yolo-Solano AQMD.

In many of the nonattainment districts, substantial additional emission reductions will be necessary in order to achieve and maintain the State ozone standard. If needed, the SCM will be available for adoption by the above five districts in order to reduce VOC emissions and attain or maintain the State ozone standard. The Yolo-Solano AQMD needs the SCM as part of its federal SIP commitment. The remaining 16 districts (not counting the South Coast AQMD, which has already adopted a rule that will achieve greater emission reductions than the proposed SCM) could also revise their existing rules to be consistent with the SCM, in order to achieve greater emission reductions from the SCM’s more stringent VOC limits.

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